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Ex Parte Communication

March 13, 2007

FILED/ACCEPTED

MAR 13 2007

Federal Communications Commission
Office of the Secretary

Marlene H. Dortch, Secretary
Federal Communications Commission
Office of the Secretary
445 12th Street, S.W.
Washington, D.C. 20554

Re: MM Docket No. 99-325

Dear Ms. Dortch:

As described in my March 9, 2007, letter, on March 8 and 9, 2007, Frank Jazzo and the undersigned of Fletcher, Heald & Hildreth PLC, and Kent Gustafson of Polnet Communications, Ltd., met with the following members of the Commission's staff to discuss issues raised in the above-referenced rulemaking docket concerning AM IBOC HD broadcasts: Christina Pauzé, Heather Dixon, Rudy Brioché, Chris Robbins and Bruce Gottlieb.

During those discussions, we were asked to provide copies or references to comments in the docket which complained of interference by AM HD IBOC broadcasts to AM analog stations. Enclosed are copies of numerous comments in the docket which assert that such interference is widespread and severe, even though AM IBOC HD broadcasts are currently only allowed prior to sunset.

Many of these comments state that the interference will be substantially greater should AM IBOC HD broadcasts be permitted at night when the AM band is already congested and subject to interference from other sources. The comments demonstrating interference include factual testimony by broadcasters and professional engineers, as well as expert analysis by the latter, supporting Polnet's concern about the adverse impact of AM IBOC on incumbent broadcasters. In some cases,

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Marlene H. Dortch, Secretary

Re: References to Interference re MM Docket 99-325

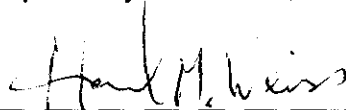
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commenters argue that AM IBOC broadcasts are causing analog broadcasters to lose their entire audiences within their protected contours, or a substantial portion thereof. The comments are so voluminous as to require e-mailing them in four separate mailings. But they clearly demonstrate that Polnet is not alone in its adverse experience with AM IBOC broadcasts' impact on its analog stations.

Should there be any questions, please contact the undersigned.

Respectfully submitted,



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**IN RESPONSE TO THE NIGHTTIME IBOC PROPOSAL (FCC Docket 99-325)
filed by Eric S. Bueneman, Amateur Radio Station N0UIH
Hazelwood, Missouri**

Background

I am a licensed Amateur Radio Operator (call sign N0UIH) who is very opposed to the implementation of In-Band, On-Channel Digital Audio Broadcasting (IBOC-DAB), not only on the AM broadcast band, but also on the FM band. IBOC will desecrate the AM and FM bands, and practically destroy the integrity of the aforementioned bands. In addition, no digital radio broadcasting, with the sole exception of digital television (DTV), should be allowed on all frequencies below 1 GHz (or 1000 MHz). IBOC-DAB is the most spectrally inefficient of all technologies ever conceived; wasting as much as 100 kHz of valuable AM spectrum space; it also wastes valuable FM spectrum space. In addition, IBOC would prove devastating to the radio industry as a whole; robbing this country of literally hundreds of independent radio stations, which more people are depending on for quality programming. Numerous markets will lose multiple signals if the FCC recklessly recommends 24-hour implementation of IBOC on the AM broadcast band. It would also be a disaster for consumers; many of whom cannot afford the high price of IBOC receivers.

The Proven Spectral Inefficiency of IBOC

It has been proven that IBOC-DAB is spectrally inefficient, especially on the AM broadcast band. The nighttime IBOC tests in late 2002 were disastrous. At my monitoring location in Hazelwood, MO, the nighttime IBOC tests of WLW (700 kHz) Cincinnati, OH were noted. The station's IBOC sidebands caused major interference to KSTL (690 kHz) St. Louis, MO (18 watts); even to the station's AM Stereo pilot tone. WLW's IBOC sidebands were strong enough to prevent any signals to be received on 710 kHz, and also interfered with stations on 680 kHz and WGN on 720 kHz. The interference was monitored using a 1986-vintage Realistic TM-152 C-QUAM AM Stereo tuner and a General Electric Superadio III. IBOC's spectral inefficiency is the primary reason why it not only shouldn't be implemented during nighttime hours, but should not be implemented on AM or FM, period. In addition, the use of IBOC or any other digital radio system on the AM, FM or shortwave bands will also pose a threat of interference to Amateur Radio interests; IBOC transmissions on harmonic frequencies could interfere with vital Amateur Radio services. The FCC should also reject other proposed digital radio systems, such as the internationally-developed DRM (Digital Radio Mondiale) system on AM and the shortwave broadcast bands; no digital audio broadcasting should ever be permitted below 1 GHz. The AM and FM broadcast bands, as well as the international shortwave bands, are not suited for digital radio. Therefore, AM, FM and shortwave radio cannot, and should not, go digital under any circumstances.

An Example of Inefficiency: IBOC Interference in the St. Louis Area

Another example of the spectral inefficiency of IBOC can be demonstrated by the use of the system on KFUD (850 kHz), licensed to Clayton, MO. The station, owned by

the Lutheran Church-Missouri Synod, has been broadcasting IBOC since the summer of 2003. From the same Hazelwood location, using the same General Electric Superadio III and Realistic TM-152, I was able to do a bandscan of the 800 to 900 kHz portion of the AM broadcast band. The bandscan of this portion of the AM broadcast band with KFUD in analog mode during daylight hours is noted below.

<u>kHz</u>	<u>Station heard (signal strength)</u>
800	KREI Farmington, MO (clear)
810	WHB Kansas City, MO (clear)
820	WCSN Chicago, IL (weak)
830	KOTC Kennett, MO (fair in Stereo)
840	Wiped out by KFUD's analog sidebands
850	KFUD has excellent sound quality; approaching FM standards
860	Wiped out by KFUD's analog sidebands
870	WINU Shelbyville, IL (weak)
880	WCBW Highland, IL (clear)
890	WLS Chicago, IL (good)
900	KFAL Fulton, MO (clear)

Now, let's contrast the above bandscan with the same portion of the AM band during daylight hours, while KFUD is operating in IBOC mode.

<u>kHz</u>	<u>Station heard (signal strength)</u>
800	KREI Farmington, MO (clear)
810	WHB Kansas City, MO (with moderate interference from KFUD's IBOC sidebands)
820	Wiped out by KFUD's IBOC sidebands
830	Wiped out by KFUD's IBOC sidebands
840	Wiped out by KFUD's IBOC sidebands
850	KFUD's sound quality suffers; it's very tinny, at best
860	Wiped out by KFUD's IBOC sidebands
870	Wiped out by KFUD's IBOC sidebands
880	WCBW Highland, IL (with severe interference from KFUD's IBOC sidebands)
890	WLS Chicago, IL (very poor with interference from KFUD's IBOC sidebands)
900	KFAL Fulton, MO (clear)

IBOC-DAB is even more inefficient at close range. Using a Jensen CD3010X in-dash, aftermarket car radio at a location in the 7700 block of Clayton Road in Richmond Heights, MO, one mile from KFUD's transmitter site, the contrast between analog-only and the use of IBOC on KFUD's signal is even more marked. Below is the analog-only bandscan of the 800 to 900 kHz portion of the AM broadcast band during daylight hours.

<u>kHz</u>	<u>Station heard (signal strength)</u>
800	KREI Farmington, MO (clear)
810	WHB Kansas City, MO (clear)
820	Image from KFUD
830	KOTC Kennett, MO (fair)
840	Wiped out by KFUD's analog sidebands
850	KFUD with excellent audio quality; approaching FM standards
860	Wiped out by KFUD's analog sidebands
870	Wiped out by KFUD's analog sidebands
880	WCBW Highland, IL (clear)
890	WLS Chicago, IL (fair)

900 KFAL Fulton, MO (fair)

Now, let's contrast this bandscan with the same portion of the AM broadcast band while KFUD is operating with IBOC from the same location.

<u>kHz</u>	<u>Station heard (signal strength)</u>
800	KREI Farmington, MO (with moderate interference from KFUD's IBOC sidebands)
810	Wiped out by KFUD's IBOC sidebands
820	Wiped out by KFUD's IBOC sidebands
830	Wiped out by KFUD's IBOC sidebands
840	Wiped out by KFUD's IBOC sidebands
850	KFUD's sound quality suffers; tinny at best
860	Wiped out by KFUD's IBOC sidebands
870	Wiped out by KFUD's IBOC sidebands
880	WCBW Highland, IL (nearly inaudible due to KFUD's IBOC sidebands)
890	Wiped out by KFUD's IBOC sidebands
900	KFAL Fulton, MO (with severe interference from KFUD's IBOC sidebands)

WCBW is operated as a ministry outreach; the station is owned by the New Life Evangelistic Center of St. Louis. Not only does WCBW provide a ministry outreach for the St. Louis metropolitan area, but it also serves as a training ground for new broadcast workers and for new air talent for Christian radio. The use of IBOC on KFUD's 850 kHz frequency impairs the ability of WCBW's 880 kHz frequency to be an effective ministry outreach for the St. Louis area.

These bandscans prove that it would be reckless for the FCC to consider implementing IBOC-DAB at any time of day or night. This proves the spectral inefficiency of the IBOC system put forth by iBiquity; therefore, it would be in the best interests of the radio industry that iBiquity's IBOC-DAB system not be implemented. The FCC would be doing the industry a favor by withdrawing type acceptance for iBiquity's system, and permanently banning all digital audio broadcasting below 1 GHz.

What Would Happen in St. Louis If IBOC Were Implemented?

The St. Louis market, presently populated with 61 stations, would lose 42 of those stations if IBOC were to be implemented, as the FCC suggests. On the AM band, only one station would remain on the air if IBOC were to be implemented: KMOX (1120 kHz), a 24-hour, 50,000-watt non-directional station, licensed to St. Louis, MO, owned and operated by Infinity Broadcasting, a division of Viacom. The market would lose all of its sources for niche programming, such as free-form talk, Oldies from the 1950s and 1960s, Rhythm and Blues Oldies (Classic Soul), and various Christian formats. On the non-commercial portion of the FM band, only three radio stations would remain on the air: KDHX (88.1 MHz), owned and operated by Double Helix, Inc.; KWMU (90.7 MHz), owned and operated by the University of Missouri, and KSIV-FM (91.5 MHz), owned and operated by Bott Broadcasting Company (all licensed to St. Louis, MO). St. Louis would lose sources for mainstream Jazz, Alternative Rock, and even some forms of Christian music. In addition, the coverage of one other station, WIBI (91.1 MHz), licensed to Carlinville, IL, would be greatly reduced. In analog mode, WIBI's signal easily reaches much of the St. Louis metropolitan area; if WIBI had to switch to IBOC,

the station's signal would not be able to get into Litchfield. On the commercial portion of the FM band, seven stations would be forced off the air (mostly Class A and B1/C3 stations); in addition, one Class B (WSMI-FM Litchfield, IL, 106.1 MHz) and one Class C (KTJJ Farmington, MO, 98.5 MHz), both of which have signals that penetrate the St. Louis market in analog mode, would have their coverages greatly reduced. WSMI-FM's signal, if IBOC were ever implemented, would not make it to Carlinville; KTJJ wouldn't be heard outside St. Francois County, MO.

More and more people are depending on independent broadcasters, such as the aforementioned KTJJ and WSMI-FM, as well as KTRS (550 kHz) St. Louis, MO, WGNU (920 kHz) Granite City, IL and even non-commercial stations like WSIE (88.7 MHz) Edwardsville, IL and KCLC (89.1 MHz) St. Charles, MO for tangible, quality programming. Corporate-owned radio stations, especially those owned by the likes of Clear Channel Worldwide, have become havens for low-quality programming. These corporate interests have been known for disenfranchising entire groups of listeners (most notably the affluent 45-64 demographic), dumping quality local programming for deceptive voicetracked programming and satellite-fed programming, negative attitudes toward trying out new talent, and general dishonesty throughout the industry.

IBOC implementation would mean the loss of many of these independent voices; in addition, many college radio stations, the few training grounds left for new on-air talent, would be lost. The loss of these training grounds would mean the loss of a pool of fresh, new talent from which many commercial radio stations can draw from; the results would also be disastrous, as in the potential death of the radio industry as a whole.

No Market for IBOC Receivers

IBOC-DAB receivers will be priced out of the range of most American consumers. Now, who would want to pay upwards of \$1,000 for a receiver that is designed to decode iBiquity's inferior system? The average American consumer will not shell out his or her hard-earned money to buy an inferior IBOC receiver, when present analog technologies like FM Stereo and C-QUAM AM Stereo are already capable of producing CD-quality sound. Motorola's latest receiver chip, the "Symphony" chip (which includes C-QUAM AM Stereo), will further improve the audio quality of analog transmissions. This chip would add only a few dollars to the cost of a receiver, while IBOC adds hundreds of dollars to the cost of a receiver. Most American consumers would prefer buying a less expensive, analog receiver with the new Motorola chip than an inferior IBOC receiver. The marketplace simply cannot support iBiquity's inferior system. The incompatibility of IBOC with present analog receivers means that many American consumers would be disenfranchised because of the extremely high price of IBOC receivers; unlike with other consumer products, the price of IBOC receivers will only go up, and will never come down. We're seeing that now with cable television rates. With over 500 million analog receivers in the U.S. marketplace (25 million of those capable of receiving AM Stereo, with such receivers continuing to be made), there is absolutely no market for IBOC receivers among the general public.

The only logical way for the FCC to go is the implementation of the proven Eureka 147 system, which is catching on in Europe, as the only acceptable system for digital audio broadcasting in the United States. In addition, the National Association of

Broadcasters should be forced to accept more competition. More competition would promote a healthier, more vibrant broadcast environment than the unhealthy, destructive environment which has been in place in the broadcast industry (especially the commercial end of the business) since the Telecommunications Act of 1996 went into effect. Less competition would be detrimental to the industry as a whole; it is very unhealthy and destructive. More competition would strengthen the radio industry.

Conclusion

The FCC would be acting in the best interests of the public if the Commission withdraws their endorsement of iBiquity's inferior IBOC system, and puts a permanent ban on digital audio broadcasting below 1 GHz. The spectral inefficiency of IBOC, as well as the incompatibility of digital radio with our current analog receivers, has already made IBOC obsolete. The Commission, by withdrawing their endorsement of IBOC, would also be able to protect Amateur Radio interests, and protect the integrity of the AM and FM broadcast service.

The National Association of Broadcasters and the Corporation for Public Broadcasting would best serve their interests by withdrawing its support for IBOC-DAB, and concentrate on improving analog broadcasting. The implementation of IBOC-DAB at night will increase harmful interference to smaller broadcasters; many of which are the only sources left for viewpoints independent of corporate control. Such interference would impair the ability of independent broadcasters to attract advertising revenue; in addition, it would impair Christian broadcasters' ability to reach out in ministry to the communities they serve.

The rejection of IBOC-DAB will be a shot in the arm for consumers, many of whom simply refuse to dole out their hard-earned money for a receiver designed to decode an inferior system. The rejection of IBOC will prevent a mass disenfranchisement of American radio listeners who do not have the financial means to purchase inferior IBOC receivers. This would pave the way for technologies which would improve analog radio, such as Motorola's "Symphony" chip. Getting rid of IBOC is in the best interests of American consumers and radio listeners.

It would also be logical for the FCC to adopt the proven Eureka 147 system for terrestrial digital audio broadcasting, allowing for more competition in the broadcast business. More competition would replace the current unhealthy environment in commercial broadcasting. In addition, the FCC would be acting in the best interests of the public by also banning the use of the DRM system on AM and shortwave stations in the United States, although Leonard Kahn's CAM-D system could be worth testing. If digital audio broadcasting is to succeed, then the U.S. must go along with the rest of the world, and endorse Eureka 147 now.

1. The ideal IBOC system would be compatible with existing analog AM broadcast stations. Unfortunately, the Ibiqurity system is not compatible because it severely degrades adjacent stations as well as its own on-channel analog signal. Following are some of the problems with the Ibiqurity system explained in more detail.

a. The Ibiqurity system cuts the existing analog AM signal's bandwidth in half, which reduces the fidelity to not much better than a telephone line: Listeners hear a low-fidelity signal with the Ibiqurity system.

b. The Ibiqurity system transmits digital noise in the passband on both sides of the remaining analog signal, filling half of the channel with digital noise. This severely degrades the signal-to-noise ratio of the received signal, making the already low-fidelity signal sound noisy to the listeners.

c. The Ibiqurity IBOC analog signal sounds even worse on high quality existing AM broadcast radio receivers because of their wider bandwidth.

d. Ibiqurity's digital signal overlaps onto the adjacent channels on both sides, rendering them unusable.

2. Widespread use of the Ibiqurity IBOC system would doom radio on the AM broadcast band because people won't listen to stations that sound bad. Instead of buying expensive digital radio receivers just to regain the sound quality sacrificed by using the Ibiqurity system, most people will simply stop listening to the AM broadcast band. Therefore, the FCC should not allow continued use of the present Ibiqurity IBOC system.

- Steven Karty, BSEE

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of:)	
)	
Digital Audio Broadcasting Systems)	MM Docket No. 99-325
And Their Impact on the Terrestrial)	
Radio Broadcast Service)	

Comments of Barry D. McLarnon

I am filing the following comments as an individual. I am a independent consultant and Professional Engineer, registered in the Province of Ontario. I have more than thirty years of experience in the analysis and design of communications systems, both analog and digital. My experience with digital broadcasting systems, primarily the Eureka 147 DAB system, dates back to the late 1980s. My motivation for filing comments on this docket stems from two principle concerns:

1. After studying all of the available reports on the iBiquity IBOC systems, I have come to the conclusion that these reports present a one-sided view of this technology and its attributes. I therefore want to bring to light certain facts that have been omitted or glossed over in these reports.
2. As a Canadian citizen, I am concerned that widespread deployment of IBOC technology in the United States will create interference that will have a serious negative impact on AM and FM broadcast services in Canada. Moreover, I believe that, at least in the case of AM, IBOC operations are not permissible under the terms of the bilateral agreement between our two countries.

My comments specifically address the hybrid AM and FM IBOC systems that were identified in the Commissions DAB R&O, and now form the basis for the proposed rulemaking. As an engineer with extensive experience in this area, I fully recognize the advantages that a digital transmission system can bring to the table, in terms of noise-free reception, multipath tolerance, carriage of new data services, and so on. However, a hybrid system that overlays such a system on an existing analog service represents a serious compromise, trading off the quality of the analog service in many instances in order to gain a limited digital service. Moreover, this tradeoff is not within the control of individual broadcasters, since the new service is gained largely at the expense of others, many of whom are unwilling or unable to take part in this transition. The details of this tradeoff remain poorly understood, because they have been downplayed by the proponents of the new technology. In particular, there has been no independent and unbiased engineering study that would provide a realistic assessment of the impact of hybrid IBOC deployment on the radio broadcast services currently enjoyed by members of the public who own an estimated 800,000,000 analog receivers. I do not purport to provide such a study; I am simply pointing out the need for it.

Hybrid IBOC causes a drastic increase in occupied bandwidth.

A key parameter of any radio emission, particularly one that is channelized, is its occupied bandwidth. The Commission's definition of occupied bandwidth is¹ "the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission". If we are modifying the emission in some fashion, then we need to know whether this will result in a change in the occupied bandwidth, and if so, the change should be quantified in order to assess the impact on adjacent channels. This in turn will provide a good indication whether existing emission masks and allocation rules are adequate to support the modification. Given the importance of this parameter, and the fact that techniques to measure it are well known, it is remarkable that it does not seem to be addressed in any of the documents and reports dealing with the IBOC systems. IBOC proponents would have us believe that, because the hybrid emission remains "under the mask", that there is no significant impact on occupied bandwidth. This is far from being the truth.

The effect of hybrid IBOC on the occupied bandwidth of an FM station is quite easy to estimate. The power spectral density of the analog signal can be modeled as a symmetrical triangular shape when plotted on a logarithmic power scale, dropping from a peak at the carrier frequency with a constant slope. This model is due to Kroeger and Peyla², who determined that the average slope for several stations observed in the Washington DC area was 0.36 dB/kHz, and the model appears in a number of the reports on IBOC from iBiquity and the NRSC. My own observations indicate that the model is a reasonable approximation of broadcast FM signal spectra, though there is considerable variation in the slope from station to station. Using this model, one can calculate the occupied bandwidth (as defined above) of the "average" analog FM signal to be 111 kHz. When the digital sidebands are added between 129 kHz and 198 kHz from the carrier frequency, with a total power of -23 dBc per sideband, the overall power increases by 1%, which appears insignificant. However, recalculating the occupied bandwidth shows that it has increased to 222 kHz! In fact, for a range of slopes around 0.36 dB/kHz, it is easy to show that the occupied bandwidth doubles when the IBOC digital sidebands are added.

For the AM signal, we do not have a mathematical model, but we do know that the occupied bandwidth is less than 20 kHz. In fact, it is probably less than 10 kHz in many cases, particularly with the talk programming that now predominates on the AM band. Even with music programming, broadcasters have recognized that most AM receiver manufacturers have reduced their audio bandwidths to less than 5 kHz, and are concentrating their transmitted energy in this region accordingly. A conservative estimate of typical AM occupied bandwidth would be 14 kHz. Now, when IBOC is added, there are primary digital sidebands in the region from 10.356 to 14.717 kHz from the carrier frequency, and they have a total power of -13 dBc. This is slightly less than 5% of the total (analog plus digital) power, so we are approximately reaching the 95% power point when

¹ 47CFR§2.202

² B.W. Kroeger and P.J. Peyla, "Compatibility of FM Hybrid In-Band On-Channel (IBOC) System for Digital Audio Broadcasting", *IEEE Trans. Broadcasting*, Vol. 3, No. 4, December 1997, pp. 421-430.

we include everything inside these sidebands, and we have to include most of the digital subcarriers in order to encompass 99% of the total power. Since the digital sidebands have an essentially flat power spectrum, we have to include about 80% of them, which results in an estimated occupied bandwidth of about 28 kHz. In other words, just as in the FM system, **adding the IBOC digital signal approximately doubles the occupied bandwidth of the AM emission.**

Section 4.2 of the US-Canada bilateral agreement on AM broadcasting³ states: "Classes of emission other than A3E, for instance to accommodate stereophonic systems, could also be used on condition that the energy level outside the necessary bandwidth does not exceed that normally expected in A3E...". The "necessary bandwidth" is defined as 10 kHz. The hybrid AM IBOC system increases the occupied bandwidth of an AM station to approximately 28 kHz, and the increased power is nearly all well outside the necessary bandwidth of the AM signal. It is hard to see how any reasonable person could interpret this new energy as not exceeding "that normally expected in A3E". I therefore submit that use of the hybrid AM IBOC system is in contravention of this agreement.

Hybrid IBOC results in a drastic increase in interference power in the adjacent channels.

In assessing the potential for interference to adjacent channel stations, it is useful, and revealing, to look at the amount of power deposited by an emission into the adjacent channels. Like the expansion of the occupied bandwidth, this is a topic that is avoided in the iBiquity and NRSC reports. Simply stating that interference will not increase significantly because existing emission masks are respected is a subterfuge that hides the problem. Clearly, the masks were designed to limit the peaks of transient out-of-band emissions resulting from the analog modulation, not to contain a digital emission having a constant power spectral density that lies just under the mask. The important parameter, as far as interference is concerned, is the *average power* radiated into the adjacent channels, since this will determine the "interference temperature" from that source at a receiver (in addition, of course, to out-of-band energy that is accepted by the receiver due to limitations in filtering).

Again using the mathematical model for the FM signal, we can calculate the average power deposited into a first adjacent channel by integrating the PSD on one side using the limits of 100 kHz and 300 kHz from the carrier frequency. For the "average" FM signal with slope 0.36 dB/kHz, this power turns out to be -39 dBc. Now, when we add the digital sidebands to the emission, each sideband contributes an average power of -23 dBc in each first adjacent channel, bringing the total in each channel to -22.8 dBc. In other words, if the model is accurate, **on average, interference to first adjacent stations will increase by about 16 dB when hybrid IBOC is added to FM stations.** The actual increase will depend on the type of modulation (e.g., mono versus stereo) and the audio processing used, but it will almost certainly be substantial in all cases. In addition, the subjective effects of the interference are likely to be greater than this difference indicates, since interference from the IBOC digital sidebands of a first adjacent extends from 2 to 71 kHz from the

³*Agreement Between the Government of the United States of America and the Government of Canada Relating to the AM Broadcasting Service in the Medium Frequency Band, 1984.*

center frequency of the desired station, with a flat power spectrum, while analog interference from a first adjacent is more concentrated near the edge of the band.

For the AM signal, we do not have a mathematical model, but we do know that the majority of the power is within 5 kHz from the carrier frequency, and almost none is beyond 10 kHz. The shape of the power spectrum is very important as well, since from the point of view of a first adjacent channel, it rolls off quickly as it approaches the center of that channel. Lowpass filtering and de-emphasis in the receiver can therefore mitigate much of the adjacent channel interference. If interference is audible, it tends to be transient in nature. The fact that AM reception is often quite acceptable with first adjacent analog interference at 0 dB D/U or worse (see discussion of receiver characteristics below) provides an informal proof of this. Interference from a first adjacent hybrid IBOC signal is much different: there is now a noise-like signal with a constant power of -16 dBc (referred to the carrier power of the interfering signal), and it falls on top of a critical part of one of the desired signal's sidebands, from 356 Hz to 4717 Hz from its carrier frequency. Objectively, this likely represents an increase of the order of at least 10 dB in the average interference power deposited into each first adjacent channel by the station when it goes IBOC. Due to the spectral distribution of this energy, the subjective effects will be much worse than an increase of this order might indicate.

Hybrid IBOC is incompatible with current allocation rules.

The Commission has stated⁴ that “Test results have indicated that hybrid IBOC operation is consistent with the Commission’s allocation rules. It is anticipated that hybrid operation would also conform to the allocation standards contained in our international agreements governing AM and FM stations”. I must respectfully beg to differ. Although the concept of IBAC (In-Band Adjacent Channel) DAB was rejected some years ago, it has now sneaked in through the back door. The iBiquity hybrid FM IBOC system is 100% IBAC, and the hybrid AM IBOC system is predominantly IBAC.

As shown in the foregoing analysis, hybrid IBOC operation results in a huge increase in the occupied bandwidth of an AM or FM emission, and a substantial increase in the average power deposited into the first adjacent channels. Moreover, the subjective effects of the interference are likely to be even more significant than the numerical increases indicate, due to the redistribution of the emission’s power spectrum towards its outer edges. It should be obvious that this redistribution puts existing allocation rules in jeopardy, and that existing emission masks are inadequate to protect the integrity of these rules.

The acid test of this is to consider the digital sidebands (only the primary digital sidebands in the case of AM) as *new stations*, and see what impact they have *vis-à-vis* the allocation rules. Of course, we must assume for the moment that the interference to analog reception from an emission on a given channel depends only on the average power of that emission within the channel, and not whether it is analog or digital. This is clearly a matter that needs further study.

The hybrid FM system creates two new “stations” in the first adjacent channels, each with a

⁴ DAB NOI, at 71

total power of -23 dBc. For a 50 kW station, each would therefore be 250 Watts. Current allocation rules provide protection of +6 dB D/U for first adjacents. If a station currently at +6 dB D/U adds IBOC, it creates a new source of co-channel interference to first adjacents at +29 dB D/U. Since the allocation rules specify a minimum of +20 dB D/U for co-channel assignments, this does not appear to be a problem. However, second adjacency is a different story. The Commission's rules permit second adjacents to be as high as -40 dB D/U on a desired station's protected contours. Therefore, a second adjacent station adding IBOC creates a new first adjacent interference source at -17 dB D/U, which is 23 dB higher than would be permitted by the first adjacent protection rules. Obviously, given the spectral concentration of the energy on the far side of the first adjacent channel, the effect is not equivalent to an analog FM signal of the same average power on that channel; on the other hand, this difference is unlikely to make up for a 23 dB shortfall. At least one of the receivers tested by iBiquity showed serious problems in such a scenario.

The hybrid AM system creates two new "stations" in the first adjacent channels, each with a total power of -16 dBc (actually slightly higher, but we will ignore the secondary digital sidebands). For a 50 kW station, each would therefore be 1250 Watts. Current allocation rules provide protection of +6 dB D/U for first adjacents. If a station currently at +6 dB D/U adds IBOC, it creates a new source of co-channel interference to first adjacents at +22 dB D/U. This is significant, since it is 4 dB more interference power than is permitted by the Commission's allocation rules for co-channel stations. Moreover, the majority of existing allocations were created when first adjacent protection was only 0 dB D/U, and this figure still applies to the Canada-US bilateral agreement on AM broadcasting. In this case, the new digital "station" is fully **10 dB higher in average power than would be permissible for a co-channel analog station**. For second adjacents, current domestic rules specify 0 dB D/U, so a new first adjacent signal created by IBOC at +16 dB D/U is compliant with first adjacent rules. In the Canada-US agreement, however, second adjacent protection is only -29.5 dB D/U. At this level, the first adjacent interference is at -13.5 dB, or 13.5 dB higher than the first adjacent protection specified in the agreement. In addition, there are many existing second adjacent allocations in the US with negative D/U ratios approaching this level. Many of the AM receiver tests conducted to date (discussed further below) confirm that these scenarios do create serious interference problems. One such interference situation (KNRC-1150 and KJJD-1170 in the Denver area) has already resulted in the offending station discontinuing IBOC operation.

It should be recognized that, with hybrid IBOC, new digital signals are being launched from analog platforms that were allocated when different rules were in place. Stating that current allocation rules provide adequate protection from these "digital missiles" is clearly incorrect. The right thing to do would be to treat these new adjacent channel signals as distinct entities, and apply the allocation rules to them accordingly.

Receiver characterization for analog compatibility has been inadequate.

Receiver performance is central to the issue of interference. Only by characterizing a sufficiently large sampling of different receivers in appropriate interference environments can one be confident about predicting the impact on the population at large. In its

comments on the MITRE Corporation study of third adjacent FM interference⁵, the NAB points to an OET study of 21 receivers that was characterized as a “fairly small” sample, and admonishes the Commission as follows: “the Commission should not rely on the results yielded from six receivers as the basis for determining whether or not third adjacent channel protection for LPFM stations can be eliminated”. Why then should it be acceptable to rely on results yielded from only four receivers to determine the extent of adjacent channel IBOC interference? It is claimed that these four receivers were carefully selected to be representative of their classes, but the details behind the selection process are unclear, and the fact remains that these are only four samples from a vast array of receivers that can have wildly different characteristics. How, for example, can a single Sony boom-box receiver possibly be considered to be representative of all portable receivers? Moreover, subsequent studies, such as those purporting to show few problems with AM IBOC nighttime operation, have focused on an even smaller subset of these four receivers.

Even within the limited scope of receivers tested for analog compatibility with IBOC, potential problems have been evident from the outset. For example, in the case of FM, the laboratory test results⁶ for the Delphi car radio when subjected to first adjacent interference with $D/U = +6$ dB showed significant degradation in signal-to-noise ratio (SNR) when IBOC was turned on. The drop in SNR was in the 10-23 dB range (depending on whether noise was added to the signal), and the resulting SNR was just slightly over 30 dB, which roughly corresponded to the “tune-out” threshold at which half of listeners would stop listening. In tests where the D/U ratio was set to -4 dB, and to -14 dB, drops in SNR of 20 to 32 dB occurred, and the resulting SNR was well below the tune-out threshold. These tests indicate a strong potential for serious degradation to analog reception inside the protected contours of first adjacent stations, and complete destruction of reception outside those contours.

The laboratory tests of second adjacent interference to FM receivers also showed problems, most notably with the Technics home hi-fi unit. This receiver provided usable performance when subjected to analog interference at D/U ratios as low as -40 dB. When IBOC was added to the interfering signal, however, reception quality deteriorated noticeably at $D/U = -30$ dB, and became unusable at $D/U = -35$ dB (i.e., below the “tune-out” threshold).

These results were largely dismissed when evaluated by the NRSC, but they are indicative that existing reception outside of protected contours will largely be lost when the hybrid FM IBOC system is in widespread use. There is also considerable potential for analog reception to be seriously degraded inside protected contours.

With the hybrid AM IBOC system, the situation with regard to analog compatibility is less clear, at least initially. The laboratory test results⁷ for the four receivers showed that all of them suffered some significant degradation when IBOC was added to a first adjacent interfering signal at +15 dB D/U , though in most cases the quality did not drop below the “tune-out” threshold. At 0 dB D/U , reception was unusable with IBOC in all cases, but it was also unusable with analog interference alone. We shall return to this point in a moment, because it is of critical importance. These results indicate that the impact of first

⁵ Comments of NAB in MM Docket No. 99-25, filed October 14, 2003.

⁶ *FM IBOC DAB Laboratory and Field Testing*, iBiquity Digital Corp., August 2001.

⁷ *AM IBOC DAB Laboratory and Field Testing*, iBiquity Digital Corp., January 4, 2002.

adjacent IBOC would be most significant somewhere between these D/U ratios. This begs the question of why there were no tests done for an intermediate level between 0 and +15 dB D/U, particularly in light of the fact that the domestic protection level for AM first adjacents falls in this range, at +6 dB D/U.

For second adjacent AM interference, laboratory test results were made available only for the same three widely-spaced D/U ratios (0, +15, +30 dB) as for the first adjacent tests. The effects of interference, with or without IBOC, were predictably negligible at +30 dB, and only the Sony receiver showed some significant degradation due to IBOC at +15 dB. Clearly, more effort should have gone into characterizing the receivers at D/U ratios less than +15 dB, particularly at negative D/U ratios. Ratios less than 0 will occur whenever the protected groundwave contours of second adjacent stations overlap, and this is not at all uncommon in practice. In fact, negative D/U ratios occur frequently. It is rather difficult to infer the potential effects of second adjacent IBOC interference in these situations when we have only data from a single relevant D/U ratio to work with. Nevertheless, two of the tested receivers (Sony and Technics) showed severe degradation to analog reception when IBOC was added to a second adjacent interference source. When the D/U ratios become negative, it seems clear that these and similar receivers will be in serious trouble.

Some additional test data for the Delphi and Sony receivers, covering a wider range of D/U ratios and with finer steps, can be found in the Clark report⁸. For the Delphi receiver, it shows the SNR with second adjacent analog interference remaining above 30 dB until the D/U ratio drops below -45 dB, while with IBOC the same transition occurs at only -15 dB D/U, a difference of 30 dB. For the Sony unit, the SNR remains above 30 dB with analog interference until the D/U drops below -15/-24 dB D/U (for lower/upper second adjacent, respectively), while with IBOC the transition occurs at about +10/+1 dB D/U, a difference of about 25 dB.

Now, returning to the question of first adjacent interference, and those poor test results at 0 dB D/U for analog-only interference. To anyone who is experienced in listening to AM skywave signals at night, this result should seem at odds with reality. With an average quality receiver, such as a typical car radio, it is possible to receive many listenable signals at night, particularly on the "clear" channels. This reception is taking place in an environment where the average first adjacent D/U ratio is generally 0 dB or less, and usually both first adjacents are significant interference sources. Another example is from the field tests conducted by Clear Channel⁹ on reception of WARK (1490) in the presence of first adjacent interference from WTOP (1500). Not only was WARK "very listenable" on a variety of receivers at 0 dB D/U, but this remained true when the D/U ratio was as low as -12 dB. When WTOP turned on IBOC, reception was destroyed at the latter D/U ratio, and noticeably or significantly impaired at all other D/U ratios, except one case where the D/U exceeded +20 dB. Yet another example is the WOR/WLW field tests (see further discussion below), in which many instances of acceptable analog reception were noted in the presence of first adjacent analog interference at 0 dB or worse.

⁸Glen Clark and Scott Metker, *Study of present Analog Signal to Noise Ratios in the AM band and the Changes that Could Result with the Introduction of IBOC Digital Radio Signals*, prepared for iBiquity Digital Corp., January 2002.

⁹Jeff Littlejohn, *Statement of Clear Channel Communications Regarding AM IBOC Field Observations*, presented to the NRSC, March 6, 2002.

The members of the NRSC DAB Subcommittee were very much aware of this discrepancy too. In Appendix D of their report¹⁰, they show test results for four car radios that still delivered listenable audio with analog interference at -30 dB D/U! This, however, was for an interfering signal modulated by a 400 Hz tone, which is a far cry from the NRSC processed noise or music used in iBiquity's laboratory tests. Typical conditions in real world AM broadcasting evidently lie between these two extremes. This topic is explored further in another part of the NRSC report, Appendix H, where it states:

"The objective of the compatibility test program is to measure differences found with the introduction of the digital signal. The undesired modulation models used for the objective and subjective tests were based on fully processed wideband music, a program format that does not fit the majority of contemporary nighttime AM broadcast stations. Assuming that the 10 kHz LP filtered audio is representative of contemporary music interference, the objective and subjective test data in the iBiquity report is representative of the A to A interference from analog stations with a music format. To make the laboratory tests represent real world interference, the test should have been conducted with talk and music interferers."

In order to underline this point, the Appendix includes results from an informal listening tests involving skywave reception of several clear channel stations. WSB (750 kHz), for example, was received clearly in spite of the presence of first adjacent WJR (760 kHz) at -10 dB D/U. It is also mentioned that if WJR turned on IBOC, reception of WSB would be obliterated as its signal-to-noise ratio would drop to about 5 dB. The author of this Appendix concludes that "off air monitoring shows that good AM audio is being received in the presence of 0 dB D/U first adjacent signals". This information, however, was not factored into the conclusions drawn in the main body of the NRSC report, where a blanket statement is made that "today's AM radios" are unable to provide acceptable audio quality with analog first adjacent interference even at +10 dB D/U, despite all evidence to the contrary.

A look at the spectrum plot for the analog interference (in the iBiquity test report, Appendix H) explains this difference between the laboratory test results and real world observations. The plot shows an extremely "heavy" analog signal with a near-flat spectrum out to 10 kHz from the carrier. This is an absolute worst case situation for first adjacent interference from analog, but few, if any, real world AM signals actually look anything like this.

The Clark report has more detailed information on the performance of the Delphi and Sony receivers with first adjacent interference, but it is based upon the same analog interference source as the laboratory test results referred to previously, and thus it shares the same flaws. It shows analog reception becoming poor even at relatively high D/U ratios (i.e., +15 dB), which flies in the face of reality.

To summarize the situation regarding analog receiver characterization:

1. Considering the far-reaching consequences of hybrid IBOC deployment, an insufficient

¹⁰*Evaluation of the iBiquity Digital Corporation IBOC System, Part 2 – AM IBOC*, NRSC DAB Subcommittee, April 6, 2002.

sample of receivers has been tested for analog compatibility.

2. For the limited number of receivers that have been tested, there are generally insufficient data points available from which to draw firm conclusions about their performance with and without IBOC interference. Rather than use a few fixed D/U ratios, standard ITU-R test methodology should have been used to determine the D/U ratios at which interference becomes significant.
3. The laboratory tests, at least for the AM receivers, do not provide an accurate assessment of receiver behavior when subjected to analog interference from adjacent channels. The quality of AM reception is generally much higher than is indicated by these tests.
4. Despite the limited scope of receiver testing to date, there is still considerable evidence that there will be very serious interference problems with analog receivers in both bands. Deployment of hybrid IBOC will result in massive losses in the coverage currently enjoyed by many stations beyond their protected contours. Given the D/U ratios at which interference is evident, coverage loss and deteriorated quality of service will also occur inside protected contours, particularly with the AM system.

The case for nighttime operation of hybrid AM IBOC remains weak.

In its *DAB R&O*, the Commission wisely refrained from permitting operation of hybrid AM IBOC at night, pending more studies of the interference problems. The NAB is now recommending that the Commission issue blanket authorization for such operation to all stations with current nighttime authorization, and in support of this recommendation, they are citing two reports issued by iBiquity. Like their previous reports dealing with IBOC, these reports contain much useful data, but the conclusions reached are biased and self-serving.

In the report¹¹ dealing with nighttime field tests, results are given for reception tests with and without IBOC between Class A stations WLW (700 kHz) and WOR (710 kHz). Although both stations have nighttime protection to their 0.5 mV/m contours, it is claimed that they have theoretical NIF contours of 2.7 mV/m and 1.7 mV/m, respectively. Subjective audio tests were conducted using recordings made during transitions between IBOC and non-IBOC mode on the interfering station. Although attempts were made to select segments in which the D/U ratio remained the same on both sides of the transition, this was clearly not wholly successful. Appendixes C through E of the report show several instances in which the average D/U ratio differed by 3 to 6 dB between the IBOC and non-IBOC halves of the segment, thus invalidating the comparison to some degree. There are also a number of results that seem clearly anomalous, showing improvements in subjective quality when IBOC was turned on. And with the selection of the recordings to be tested entirely in the hands of the proponent, what guarantees are there that we are seeing an unbiased sampling of the results? The report also fails to provide details on the reception conditions that existed during the tests (e.g., propagation indices, local and atmospheric noise levels), or how observed field strengths compared with predicted levels.

¹¹ *Field Report, AM IBOC Nighttime Compatibility*, iBiquity Digital Corp., October 31, 2003.

These reservations aside, I concur with the report's conclusion that "Interference from IBOC is D/U dependent and is expected to have its greatest impact below 0 dB D/U ratio". When you consider that at 0 dB D/U, the signal-to-noise ratio of the desired signal has already plummeted to no more than 16 dB due to co-channel noise from the primary digital sideband, you can see that, if anything, this is an understatement. However, it is stated that this is of little consequences, since D/U ratios this low occur largely outside the theoretical NIF contour. While this may well be true, the critical question is this: how much useful reception currently lies outside this artificial line? If the answer is "very little", then we should pose a follow-up question: has the notion of "protected contour" become meaningless? If it is the case that co-channel interference sources are dominant in the NIF calculations (and that these co-channel stations are real, and not artifacts from a notoriously unreliable database), then we may have to concede that these NIFs reflect reality. This report, however, conveniently provides evidence to the contrary. In the majority of instances where the D/U was 0 dB or less, analog reception was quite satisfactory when IBOC was not present on the first adjacent station. This fact alone undermines the report's conclusion that "the primary service area of the station should not be affected by IBOC". This is simply not true, unless you accept a rather drastic redefinition of the term "primary service area". This report provides further proof that, in today's AM broadcast environment, successful reception with analog first adjacent interference at 0 dB D/U or lower is very common. Therefore there is a huge potential for loss of coverage due to IBOC on first adjacents.

By my estimate, the area enclosed by the claimed 2.7 mV/m NIF contour for WLW is only about 20% of the area enclosed by their 0.5 mV/m groundwave contour which, in principle at least, is their primary service area. Are the owners of WLW willing to cede 80% of this area to interference, to say nothing of their secondary coverage? Do they recognize that a NIF of 2.7 mV/m or worse, while a theoretical artifice today, will become a harsh reality with nighttime IBOC? Of course, WLW is not the worst case one can imagine. With 690 kHz being a Canadian clear channel, WLW only has to be concerned with first adjacent IBOC interference from one side. Consider the fate of 690 kHz Class A station CINF in Montreal, which is in a position to get not only severe nighttime interference from WLW, but even greater interference levels from WRKO (680 kHz), should that station decide to convert to IBOC.

This report represents the only new field test data to become available since the *DAB R&O*. It examines interference only between a single pair of Class A stations. It fails to build a convincing case that there will be no harmful interference or significant loss of coverage between these two stations if they use IBOC at night. And even if you did accept the report's conclusions, it would be foolish to try and extrapolate them to infer the effects of nighttime IBOC in general. What will happen when IBOC is on both first adjacent channels? What about the effects of IBOC on second adjacents? How does the situation change when the neighboring channels are regional or local, rather than clear? This report clearly raises many more questions than it answers.

The second report¹² attempts to answer some of these questions, but through a simulation study rather than field tests. The approach taken is a useful and laudable one, since it takes into account actual receiver characteristics, and includes the effects of both first and second

¹²AM Nighttime Compatibility Report, iBiquity Digital Corp., May 23, 2003.

adjacent interference in addition to co-channel. This study is a good indication of where radio broadcast interference studies should be going in the future. That said, I have some serious reservations about this particular study, and the conclusions that are drawn in the report. The underpinnings of the study are subjective tests using recorded material gathered during laboratory tests of the receivers, with analog and digital interference at various D/U ratios. The subjective testing did not use standard ITU techniques, nor has the methodology used been validated by independent experts in the field (these comments also apply to all such studies conducted by iBiquity). As in previous studies, the effects of analog-only interference are greatly exaggerated by the use of an atypical, heavily-modulated wideband source. This can clearly be seen in Figure C-4, showing subjective test scores for the Delphi receiver with first adjacent interference. The test score for analog interference is already becoming poor when the D/U ratio falls to +6 dB, whereas we know that, in reality, good analog reception is often possible with negative D/U ratios.

Despite this bias towards exaggerating the extent of current interference problems, there are some interesting results in this report. Nearly all of the examples in the report were done with a single receiver model, based on the Delphi car radio. This is described as being a “worst case”, but is actually far from it, being the best performer of the four receivers previously tested. In particular, it has very good immunity to second adjacent interference, either analog or digital. More illuminating are the results for the simulations involving the Sony portable receiver, which estimates that **20% of listeners using a receiver with similar characteristics, inside the 5 mV/m contours of desired stations, will be negatively impacted by IBOC interference.** Keeping in mind the fact that this is almost certainly an underestimate, due to the baseline assumption of severe analog interference as mentioned above, this is an extremely alarming statistic.

Here is where the report really goes off the deep end. The authors suggest that the Sony model is actually a less severe case than the Delphi, since the Sony receiver contains a directional antenna that can be used to null the source of IBOC interference, unless it happens to be roughly in the same or opposite direction as the desired station. As a general solution to the problem of IBOC interference, this suggestion is ludicrous. What about car radios whose characteristics are closer to the Sony than to the Delphi? What if the receiver's physical location is such that it cannot easily be rotated to get the desired nulling effect? What if the nulling capability is already being used to eliminate a co-channel interfering station or a local source of noise? What if there are multiple sources of IBOC interference? There are four adjacent channels with possible IBOC interference, and some of them may have more than one significant source (especially if they are not clear channels), so having only source of IBOC interference to deal with will be the exception, not the rule. The study could have predicted just how often there would be one dominant source of interference that could potentially be nulled, but if this was done, it was not reported.

Given the flaws in this study, one cannot take seriously its conclusion that “complete conversion to IBOC at night will not noticeably degrade primary groundwave service in a vast majority of listening areas”. On the contrary, rational analysis of the evidence points to chaos and floods of complaints long before “complete conversion” is reached, if nighttime operation is authorized.

Although not dealing with the compatibility issue, a third report¹³, on performance of the IBOC system during the WLW/WOR field tests, is worth noting. The edge of "digital coverage" (where the final blend to analog occurs, though there are intermittent blends closer in) on four radials ranged from 2.5 to 3.7 mV/m for WLW, and 2.2 to 6 mV/m for WOR. The report says "although digital coverage will not extend to all areas currently able to receive analog signals, the digital signal will cover the primary service areas of these stations". Those "primary service areas" just keep shrinking! What the report neglects to mention is that the quoted "digital coverage" is for "core mode", which provides 20 kb/s monophonic audio. Earlier reports showed that the "enhanced mode", providing 36 kb/s stereo audio (plus some dedicated data subcarriers) will often have significantly less coverage than core mode, especially at night. This information would be of considerable importance to an AM broadcaster who is counting on conversion to hybrid IBOC to provide "FM-like" quality to support a new format. It is unacceptable that this information has been suppressed in this report.

Conclusions

Because the iBiquity hybrid FM "IBOC" system is actually an IBAC system, and the hybrid AM "IBOC" system is predominantly IBAC, they cause a drastic increase in the occupied bandwidth compared to their host analog emission. They also cause a dramatic increase in interference power deposited into the first adjacent channels. These new digital emissions cannot be absorbed into these bands under current allocation rules without creating widespread interference to existing analog services. Emission masks intended to limit transient peaks in analog modulation cannot be packed with constant power digital emissions without wreaking havoc on adjacent channel stations.

If the hybrid IBOC experiment must continue (and there is no doubt that it will, given the investment that has already been made), then it should continue on FM only. It should be recognized, however, that due to the IBAC nature of the hybrid FM emission, the Commission's allocation rules are inadequate to protect stations from interference from second adjacent channels. There will be widespread loss of existing coverage outside of protected contours, and in some cases, significant interference inside these contours.

AM has inherently greater susceptibility than FM to interference and a more complex interference environment due to nighttime skywave. Add to this the fact that the AM hybrid IBOC system has significantly higher digital power relative to the analog power than does the FM system (7 dB higher in each first adjacent channel), and you have an untenable situation. As demonstrated above, the Commission's allocation rules are inadequate to protect stations from interference from hybrid IBOC on first and second adjacent channels. Even in daytime only operation, there will be many instances of serious interference to analog service inside protected contours, mainly from short-spaced second adjacents. At night, a band populated by many hybrid IBOC signals will become a quagmire of noise. Class A stations will be particularly hit hard, with most suffering partial or complete loss of secondary coverage, and significant shrinkage of their primary coverage areas. Only those stations having a NIF contour that is currently completely dominated by co-channel interference are likely to emerge relatively unscathed.

¹³Field Report, *AM IBOC Nighttime Performance*, iBiquity Digital Corp., October 20, 2003.

The hybrid AM IBOC system also creates an unacceptable situation for neighboring countries. In particular, the allocation rules in the Canada-US bilateral agreement on AM broadcasting preclude the use of the hybrid system when the primary digital sidebands are properly viewed as new, adjacent channel emissions. Moreover, adoption of the hybrid system would clearly contravene the provisions of the agreement that deal with occupied bandwidth.

The transition to digital broadcasting in the AM band by means of a hybrid overlay is unworkable, as it requires unacceptable tradeoffs in the quality and coverage of existing analog service. It should be set aside until such time as it becomes viable for broadcasters to begin an all-digital service that is truly IBOC in nature and can coexist with adjacent channel stations, whether they be analog or digital. Experimentation with the hybrid AM system should only be permitted on a non-interference basis. This means that the primary digital sidebands should be treated as distinct entities, and be subject to the allocation rules that would apply to the channels in which these sidebands lie. Although we do not know how interference from analog and digital sources compare subjectively, it must be assumed (i.e., for the purposes of RSS calculations), that emissions of equal average power within a given channel bandwidth are equivalent in terms of their potential to cause interference.

Respectfully submitted,

Barry McLarnon, P.Eng.

2

I would like to comment in opposition to IBOC aka HD Radio being allowed on the AM broadcast band.

First, the sideband interference would cause immediate and severe interference to existing broadcasters. In many cases, especially after sunset, it would raise the non-interference contour of adjacent stations significantly. The NRSC mask is being improperly applied when claims to the contrary are being put forth. That mask was never intended for continuous data stream modulations.

Second, mandating a proprietary system with recurring license fees goes against prior history. The fact that one entity, and one entity only will benefit from these fees is wrong. It becomes a defacto monopoly. Any digital broadcast scheme should be open source with fully published specifications.

Third, it is a solution to a non-problem. There has been no consumer outcry whatsoever for a better means to listen to existing programming.

I have been a broadcast engineer for nearly 35 years. IBOC/HD Radio is a damaging technology which is ill-suited to coexist with analog transmission. Tests so far have concentrated on one IBOC station and one non-IBOC test subject. The aggregate effects of a band full of these digital carriers will cause interference far beyond what the proponents suggest.

I urge the Commission to reject nighttime permission of any IBOC/HD Radio transmissions pending a full review by an independant body.

Stephen Craig Healy

F.C.C.
Washington, D.C.

June 10, 2004

The success of AM Broadcasting generally lies within the numerous small communities of America that have continued to function beyond the FCC mandates that have continually burdened the industry with technical garbage such as flawed AM stereo (Motorola CQuam).

This flawed system was wholeheartedly embraced by the FCC but never by the most important sector; those that own and attempt to serve and make a living with AM radio.

The metropolitan areas of the country, which own the 50kw powerhouses, are again attempting to drive the real true Broadcasters of America. They are, in general, gimmick driven operators that want scrolling on radio and other gimmicks, on one channel and in the end result will never devote any real public service to their communities and listeners.

AM radio, as it is today, is the only service that can disseminate communications nationwide. Satellite radio and TV can be compromised with one low-level terrorist blast right in the middle of our closely knit satellite outer space grouping. One big bang and the whole satellite system is history. No more birds from space!

FM broadcasting is compromised by it's inability to reach over the horizon, and it's coverage is compromised by the average operators inability to afford 2,000 foot towers, and fight with the environmental wackos that preclude the building of maximum service facilities.

On the other hand, AM radio could and does cover the entire country. Given an equal playing field it will eat FM alive. It, however; has been continually compromised by the failure of the FCC to set receiver standards for AM radios. For years, all emphasis has been on FM receivers.

I have in my possession a large collection of AM radios from 1955 back that will eat alive any FM being given the same playing field. 1/4 wave FM aeriels adorn almost every FM radio; but woe is me, I have yet to see a 1/4 wave antenna on an AM radio for, 185' at 1240 would be a little unwieldy; however, when I was a youngster, and still even at my home today, an end fed horizontal wire 150' long between two trees will eat any FM alive, given radio to radio quality. At night, AM does suffer interference on some frequencies, but as I drive at night, or listen on my quality AM systems at home. I can always hear WLS, WGN, WBBM, KOA, KCMO, KSTP, KOMA, and WSM and many others. I always can hear a station.

Now along comes IBOC with it's fancy gadgets that have nothing to do with communications and it's built-in white noise generators that will destroy the AM spectrum. Noise out to three channels from the offending transmitter. (WE DON'T NEED IT.) What we do need is less gadgetry and more effort into building quality radios with good noise blankers, good bandwidth, and excellent sensitivity and selectivity. They can be built. I have heard it said that America has approximately one billion AM radios currently in existence that will become obsolete immediately upon the arrival of IBOC.

My solution is simple. Let those of us who have the investments do our own thing as long as it stays within the NRSC guidelines and stay within the 10 kc window. I for one would choose Cam D by Kahn. As I cannot only promote the use of new and better radios, but would also not obsolete the many radios out there. Opponents would immediately say that without a standard, no listeners would be had.

Well, you have been telling me for the last 30 years that no one listens to AM anyway! So what's the difference? I beg to differ with you; however, as my AM facility garners more audience than my FM. So let me run it. AM is very healthy and alive in rural America and it certainly doesn't need another flawed FCC mandated debacle.

My answer is 6 simple steps!

1. No AM radio station in America should be operating with less than 100 watts between 6am and 6pm local time. The hell with 5-6-8-9-10 watt signals, it's a joke.
2. No radio manufacturer should be allowed to build and sell an AM radio that does not meet quality sensitivity and selectivity standards; with modern noise reduction technology.
3. Every AM station in America should be encouraged to develop antenna systems that approach .625 wavelength standards in order to reduce skywave interference and enhance daytime coverage.
4. And, finally, listen to the old man from New York who forgot more about quality AM than any of the gadget oriented freak engineers of today. We who have been AM pioneers have paid our dues and we don't need an oppressive government to screw us over with another flawed system.

In conclusion, I was raised on AM. I Love AM and I don't need it destroyed again (IE: C Quam). Please don't do this to us.

(An AM Broadcaster)

✓

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
Amendment of Part 73 of the)	
Commission's Rules to Permit)	MM DOCKET No. 99-325
The Introduction of Digital)	
Audio Broadcasting in the)	
AM and FM Broadcast Services)	

COMMENTS of Kevin Tekel

As one of the many individuals dedicated to the continued viability of the AM radio broadcasting band, I simply cannot put any support behind an inherently flawed system such as iBiquity's "HD Radio", a.k.a. IBOC, which will cause great harm in order to achieve meager benefits.

Over the past two years, radio listeners throughout North America have consistently voiced their concerns about the destructive interference that use of IBOC causes on the AM band, especially under nighttime skywave signal conditions. In fact, some listeners have even issued complaints to their local electric utility company, mistaking AM IBOC's characteristic "hash" for power line interference.

Introduced a decade ago, the current FCC standards regarding the acceptable bandwidth of an AM broadcast signal were intended to prevent analog AM signals from "splattering" beyond a +/- 10 kHz spectrum allocation. These "NRSC" regulations have proven to be very effective, and have allowed for the continued manufacture and use of high-fidelity, wide-bandwidth AMAX AM Stereo receivers.